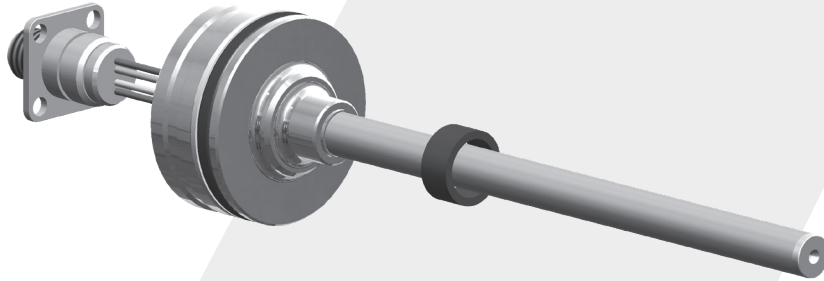


Installation manual

MAGNETOSTRICTIVE LINEAR POSITION SENSOR



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1. Introduction

Before placing the sensors in operation, read carefully this documentation and follow the safety instructions. The technical documentation provided below contains information about the mechanical installation and the electrical cabling of the 7M sensors. Such operations must be carried out by qualified personnel and/or by technicians that are familiar with the management of this type of sensors.

Description

The 7M sensors are designed based on the most recent standards of the electronic and mechanical engineering. Therefore they are state-of-the-art products that comply with the EMC requirements for the emission of disturbances and for the immunity of vehicles and mobile machines, according to the standards in force. However, an incorrect installation or their inappropriate use may bring danger to the user or third parties, or cause damage to the sensor and to other apparatuses.

The sensors of the 7M family are conceived to measure positions in mobile hydraulic applications. The sensors provide a measure of the position and must be connected to adequate evaluation electronics, for ex. a PLC, IPC, ECU or indicator or another type of electronic control capable of interpreting their signals correctly.

As a pre-condition to guarantee the correct operation of the sensor, it is mandatory to carry out its transport, storage, assembly, commissioning and operation according to the instructions of the present manual and the product specifications (datasheet). To ensure this condition and guarantee a correct operation, the installation, connection and maintenance interventions must be performed only by qualified and authorised personnel.

2. Installation and operation

A fault or malfunction of the sensor may bring danger to people or constitute a potential threat for damage to the structures or apparatuses directly or indirectly connected to such sensor. Appropriate additional safety measures must be provided, as plausibility controls, limit switches, stop and emergency systems, protection devices, etc., to prevent the occurrence of dangerous damages. In case of malfunction, the sensor must be switched off and disconnected from the rest of the apparatuses. Failure to comply with these safety procedures exempts the manufacturer from any liability arising from the inappropriate use of the product.

To guarantee the functioning of the sensor it is indispensable to comply with the following provisions:

- Protect the sensor against mechanical damages during transport, installation and operation.
- Do not open or disassemble the sensor.
- Connect the sensor correctly and make sure that the polarity of the connections, the operation voltage and the supply current comply with the indications in the specification.
- The electrical connection must be performed according to the safety instructions for electrical equipment and only carried out by trained personnel.
- Use adequate cables, possibly shielded, directly connected to the sensor, avoiding ring connections.
- A checking procedure of the correct operation of the sensor must be carried out periodically (ex. by checking known positions).
- Before placing the apparatuses in operation, make sure that the safety of anyone will not be impaired by the starting of the machines.
- Tests of insulation, welding or painting the machine or parts of the machine (cylinder, work machine, etc.) may damage or destroy the position sensor. In these cases, all pins of the male connector of the sensor must be connected in short circuit to zero.

- The connector for connection to the connector must guarantee an adequate protection degree IP (≥ 67) in order to avoid the penetration of any foreign agent.
- Avoid the presence of strong electrical or magnetic fields in the proximity of the position magnet.
- Do not connect or disconnect the sensor when under voltage.
- Do not expose the sensor and the magnet to shocks or strikes.
- Do not use screws or magnetic pieces in the proximity of the sensor and to fix the cursor.
- Respect the specified temperature range.
- The sensor performance, as specified in the catalogue, is guaranteed with the use of OMFB magnets and under the specified environmental conditions.

3. Repairs

Repairs on the sensor can only be carried out by OMFB or by an entity expressly authorized by OMFB.

4. Warranty

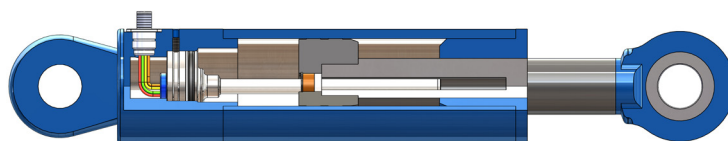
Please refer to the general warranty conditions in the site www.omfb.com

5. Description and technology of the product

The 7M sensors are designed to be used in mobile hydraulic applications for the accurate measure of positions and constitute the ideal replacement for linear contact sensors (potentiometers), offering with respect to these better performance and unlimited service life due to the absence of friction elements. The 7M sensors are resistant to vibration, shocks, dust, atmospheric agents and electromagnetic disturbances and are therefore used successfully in hydraulic units of farming machines, construction machines, earthmoving equipment, steering systems, lifting systems, etc.

Magnetostriction

The 7M linear sensors are based on the magnetostrictive technology: a position magnet placed close to the sensor but without direct contact, provides the absolute position of the element connected to it. The electronics installed on the sensor head determines the operation of the sensor every thousandth of a second (for a stroke of 300 mm.) A current pulse is launched into the wave guide, which propagates at the speed of light, whose magnetic field meets the magnetic field of the position magnet, generating a sonic wave return, which propagates at a speed of around 2800 m/s, which is intercepted by the sensor electronics. The time elapsed between the launch of the impulse and the interception of the sonic wave, combined with the typical sonic speed of the wave guide, will provide the exact position that the electronics will convert into an output signal.



The sensor is composed by the following principal parts:

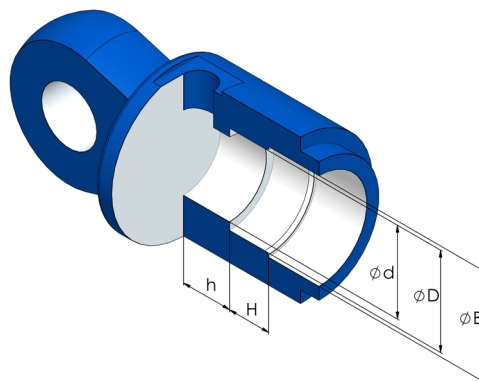
- Connection system composed by the Snap-in type connector (M12 4 or 5 poles) that can be easily installed in a few seconds, avoids any kind of welding or crimping. It is sealed against dust and liquids up to IP69K depending on the type of connector.
- Stainless steel housing with built-in electronics for the emission and conversion of the signal.
- The position magnets that slide along the sensor without contacting the tube determine the effective position.
- The sensor rod contains the protected magnetostrictive sensible element.

6. Mechanical installation

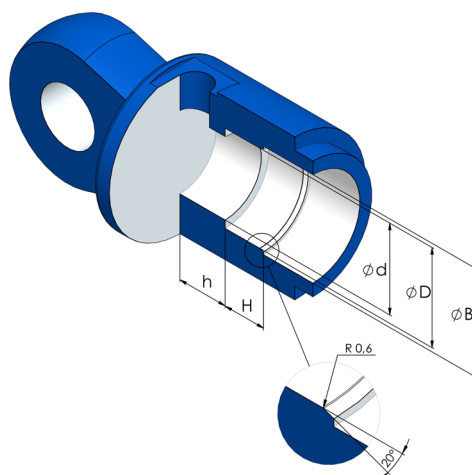
The sensor has been designed to be installed inside hydraulic cylinders which have the following mechanical characteristics:

Model	B cylinder \varnothing	D min. \varnothing	H depth	D min. \varnothing	h depth
7M	52 mm	48H8 screw fixing 48G7 welded	21.2 mm + 0.2	32.5 mm < D < 40 mm	> 18 mm (cable) > 15 mm (connector)

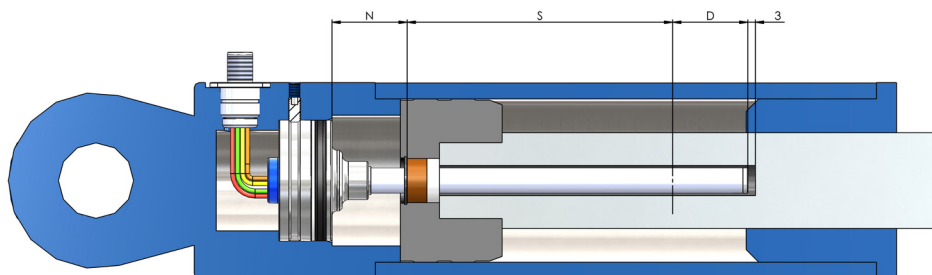
6.1 Overall dimensions



To allow a correct and easy mounting of the sensor in the cylinder it is necessary a chamfered edge as shown in the drawing. To avoid damaging the O-ring during the installation, the radius in the passage from the hole to the chamfered edge must be R0.6 - R1. Without this radius, there will be a sharp edge that can damage the O-ring.



Diameter and depth of the hole in the piston rod



The depth of the hole in the rod is given by the following sum: composed by the measuring field (S), chamfer (D) and a 3 mm play (depth = S + D + 3 mm).

N = null zone	30 mm
S = stroke range	see ordered model
D = chamfer	see model

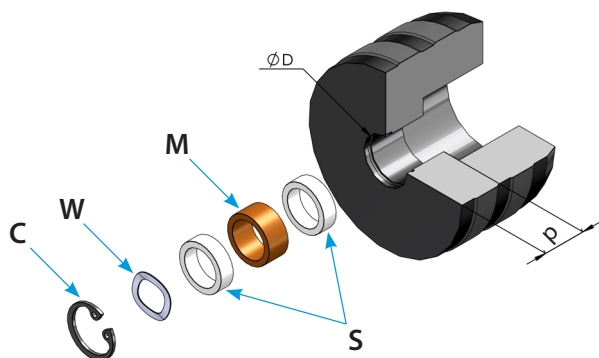
Attention:

- The position magnet must not touch the sensor rod
- Do not exceed the operation pressure.

6.1 Installation of the magnet

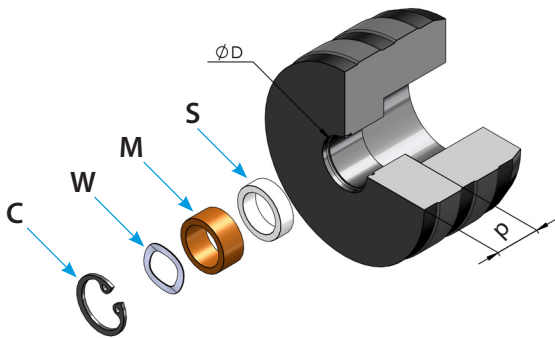
Use only spacer rings of non-magnetic materials as polyamide or non-magnetic aluminium. We recommend fixing the magnet with an elastic ring and a stop ring. If these parts are in non-magnetic stainless steel, the second spacer ring is not necessary.

Magnet with 2 spacers



	Description	Dimensions	
M	magnet	17.4 x 13.5 x 7.9	25.4 x 13.5 x 7.9
D	\varnothing hole diameter	17.5 + 0.1	25.5 + 0.1
p	Seat depth 2 spacers	18.0 + 0.1	18.0 + 0.1
S	spacer OD x 13.5 x 5	17.4 + 0.1	25.4 + 0.1
W	wave washer	OD: 16.5 - 17.4 ID: 13.5 - 14	OD: 23.5 - 25.4 ID: 13.5 - 14
C	safety ring	DIN 472 - 18 x 1	DIN 472 - 26 x 1,5

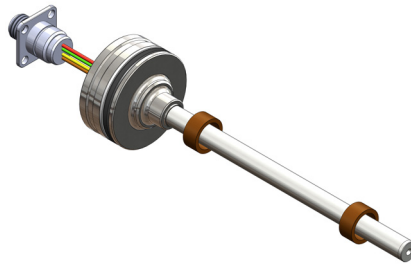
Magnet with 1 spacer



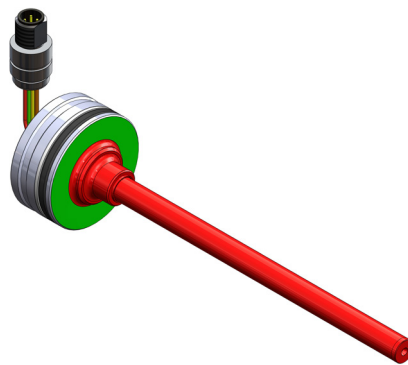
	Description	Dimensions	
M	magnet	17.4 x 13.5 x 7.9	25.4 x 13.5 x 7.9
D	∅ hole diameter	17.5 + 0.1	25.5 +0.1
p	Seat depth 1 spacer	13.0 + 0.1	13.0 + 0.1
S	spacer OD x 13.5 x 5	17.4 + 0.1	25.4 +0.1
W	wave washer	OD: 16.5 - 17.4 ID: 13.5 - 14	OD: 23.5 - 25.4 ID: 13.5 - 14
C	safety ring	DIN 472 - 18 x 1	DIN 472 - 26 x 1,5

6.2 Sensor installation

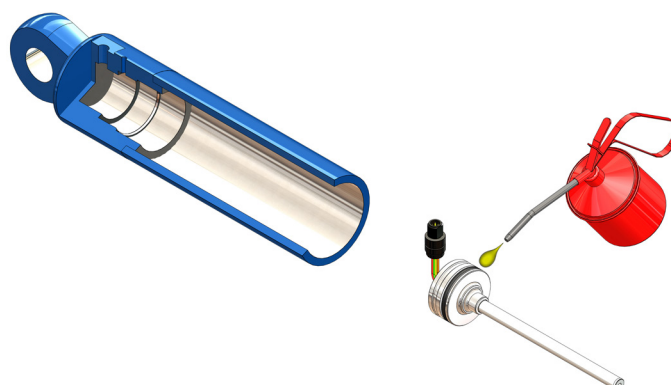
The O-ring and the anti-extrusion ring are mounted in the factory as shown in the figure.



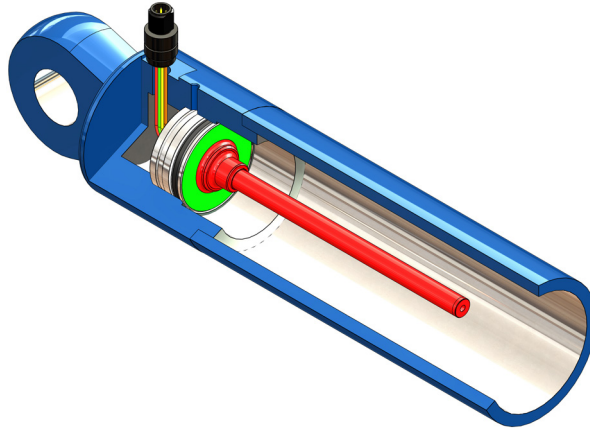
During the mounting of the sensor in the cylinder only the surfaces marked in green can be loaded. The surfaces marked in red must not be submitted to efforts and even less to hammer strikes.



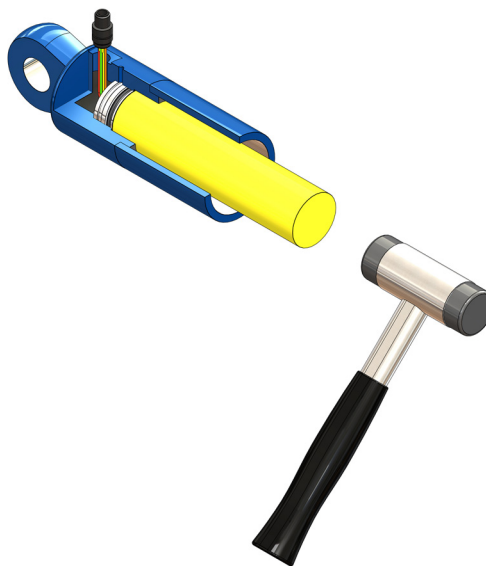
Lubricate the O-ring and the anti-extrusion ring before mounting them in the cylinder.



Insert carefully the contact holder piece (piece in black plastic) through the cylinder wall. Make sure to keep the conductors away from sharp or pointed edges. Avoid traction efforts on the connection cable. It is recommended to use a system that pulls delicately the wires out of the final seat of the connector.



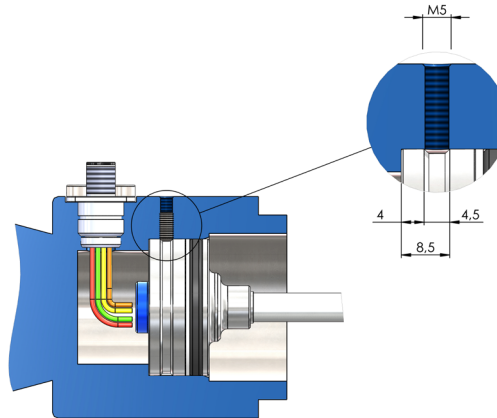
Push the sensor carefully into its seat. Make sure the conductors or cables do not remain under mechanical stress. Use a specially prepared bushing (for ex. polyamide) to press the sensor. If necessary, use a rubber hammer to carefully push the sensor to its position against a mechanical stop. Never use a metallic hammer.



After the installation in the cylinder and the insertion of the connector into its flange, the sensor fulfils the protection requirements of IP68 or IP69K according to the protection degree of the coupled female connector.

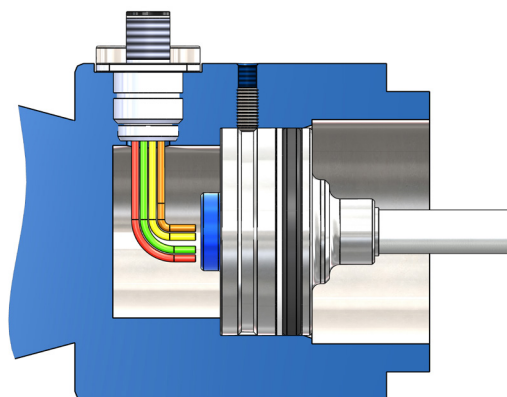
Safety screw according to DIN 913

The grub screw M5x10 according to DIN 913 with flat end can be used for the sensors. This safety grub screw is necessary to block the sensor housing in the axial direction and it is sufficient that it stops against the sensor channel. Therefore a max. torque of 0.5 Nm is recommended to avoid damage to the sensor. The grub screw is blocked with thread locks.

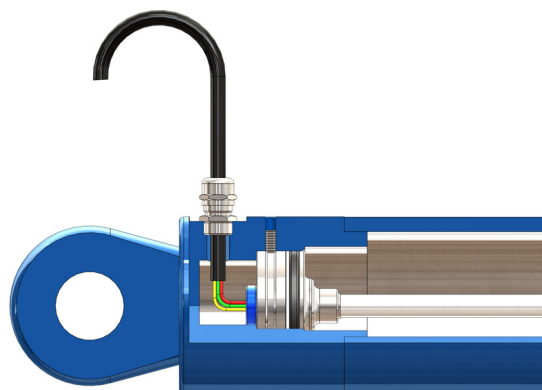


Fixing of the safety connector flange according to DIN 913

The use of a cylindrical head screw with internal hexagon M4 DIN 912 or DIN 7984 is recommended.



Mounting of the sensors with cable and cable clamp connection



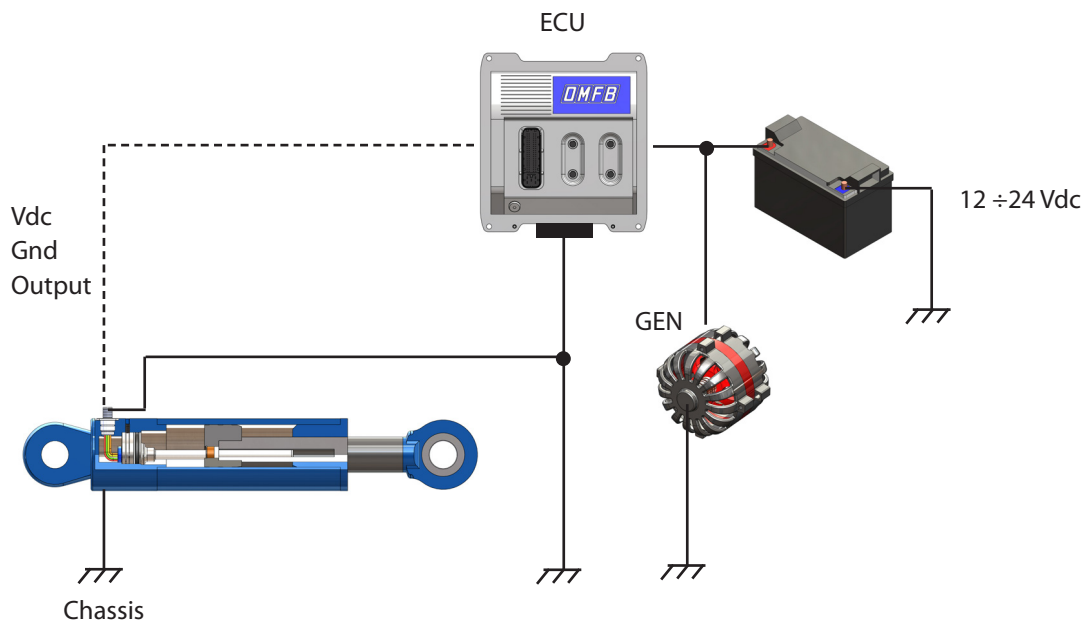
The sensors with cable connection must be mounted with an IP68 cable clamp (ideally metallic).

7. Electrical connection

- The cable between the sensor and the electronics must be separated from the network and power supply cables. A minimum distance of 500 mm is necessary.
- A low-pass filter with a cut-off frequency of 5 kHz at the input of the electronics, which acquires the analogical signal of the sensor, is recommended to minimise the effect of possible disturbances.
- To prevent potential equalisation currents through the cover, the connection of all components to the equipotential lines is recommended.
- The electric connection cable has a strong influence on the electromagnetic compatibility of the position sensors. There fore it is recommended to:
 - Use a shielded cable with pairs of twisted wires for the power supply and outputs.
 - Connect the shielded cables to the ground on the electrical panel side.
 - Avoid installing the sensor cable close to high-voltage power sources, such as high-power motors (use separated and shielded cables for each device).
- If an application includes equipment that emits strong electromagnetic interferences, such as inverters or motors, it is necessary to take the following precautions:
 - Use a shielded cable with twisted wires and insulated pairs.
 - Position the cable inside a metallic shield that will be connected to the ground

7.1 Connection of the control unit

The connection of the control unit (ECU) must follow the diagram indicated below.



OMFB reserves the right to make functional or aesthetic changes at any time and without notice.



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